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Engineering Design File

NESHAP Compliance Demonstration for the ICDF Complex

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4. Summary:
Wastes from Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) remediation sites within the Idaho National Engineering and Environmental Laboratory (INEEL) boundary will be taken to the INEEL CERCLA Disposal Facility (ICDF) for processing and disposal. The CERCLA wastes will contain low concentrations of radionuclides. Activities associated with the handling of these wastes are anticipated to release radionuclides into the ambient air. The State and the Environmental Protection Agency (EPA) regulate radionuclide emissions. Emissions are limited to the Agency standard of 10 mrem/yr for the Site and an operational constraint of 1 mrem/yr for the ICDF. To determine compliance with the standards, emissions can be estimated using EPA AP-42 emission factors and guidance from Appendix D to 40 CFR 61.

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CONTENTS

ACRONYMS

CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
DOE	Department of Energy
DOE-ID	Department of Energy Idaho Operations Office
EDF	Engineering Design File
EPA	Environmental Protection Agency
HEPA	high-efficiency particulate air
ICDF	INEEL CERCLA Disposal Facility
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
IWTS	Integrated Waste Tracking System
LDR	land disposal restriction
MEI	maximally exposed individual
NESHAP	National Emission Standards for Hazardous Air Pollutants
OU	operable unit
PCB	polychlorinated biphenyl
RBA	Radiological Buffer Area
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
SSA	Staging and Storage Annex
SSSTF	Staging, Storage, Sizing, and Treatment Facility
TSCA	Toxic Substances Control Act
TSP	total suspended particulate
WAG	waste area group

NESHAP Compliance Demonstration for the ICDF Complex

1. INTRODUCTION AND PURPOSE

The Department of Energy Idaho Operations Office (DOE-ID) authorized a remedial design/remedial action for the Idaho Nuclear Technology and Engineering Center (INTEC) in accordance with the Waste Area Group (WAG) 3, Operable Unit (OU) 3-13 Record of Decision (ROD) (DOE-ID 1999). The OU 3-13 ROD requires the removal and on-Site disposal of some of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) remediation wastes generated within the boundaries of the Idaho National Engineering and Environmental Laboratory (INEEL).

The INEEL CERCLA Disposal Facility (ICDF) Complex is an on-Site, engineered facility, located south of INTEC and adjacent to the existing percolation ponds. Designed and authorized to accept not only WAG 3 wastes, but also wastes from other INEEL CERCLA actions, the ICDF Complex will include the necessary subsystems and support facilities to provide a complete waste management system.

The major components of the ICDF Complex include

- The disposal cells (landfill)
- An evaporation pond, consisting of two cells
- The Staging, Storage, Sizing, and Treatment Facility (SSSTF).

The ICDF Complex, including a buffer zone, covers approximately 40 acres, with a landfill disposal capacity of approximately 510,000 yd^3. The ICDF landfill meets the substantive requirements of Resource Conservation and Recovery Act (RCRA) Subtitle C (42 USC 6921 et seq.), Idaho Hazardous Waste Management Act (HWMA 1983), DOE O 435.1, and Toxic Substances Control Act (TSCA) (15 USC 2601 et seq.) polychlorinated biphenyl (PCB) landfill design and construction requirements. The landfill is the consolidation point for CERCLA-generated wastes within the INEEL boundaries. The landfill will be able to receive CERCLA-generated wastes outside WAG 3 that meet the land disposal restriction (LDR) requirements (DOE-ID 2002a, 40 CFR 268). Waste generated within the WAG 3 area of contamination that has not triggered placement is not required to meet LDR criteria.

The evaporation pond, designated as a RCRA Corrective Action Management Unit in the OU 3-13 ROD, will be the disposal site for ICDF leachate and other aqueous wastes generated as a result of operating the ICDF. In addition, other aqueous wastes such as existing Group 4 and Group 5 purge water may be sent to the evaporation pond in accordance with the ICDF evaporation pond Waste Acceptance Criteria (DOE-ID 2002b).

The Staging and Storage Annex (SSA), located within the INTEC fenced area, serves as a temporary staging and storage area for INEEL CERCLA waste. The waste in the SSA will be designated for

- Direct disposal to the ICDF landfill
- Direct delivery to the evaporation pond

- Staging, storage, or treatment in the SSSTF
- Packaging in preparation for off-Site disposal
- Other INEEL on-Site disposal
- Off-Site disposal.

Wastes from WAG 3 and other CERCLA actions within the INEEL boundaries will be stored at the SSA during the design and construction of the ICDF Complex. Following construction, the operation of the SSA will be in accordance with the ICDF Complex Remedial Action Work Plan (DOE-ID 2003). The ICDF Complex will accept only low-level, mixed low-level, hazardous, and TSCA remediation wastes for disposal (DOE-ID 2002c). Current projections of Site-wide CERCLA waste volumes total about 510,000 yd^3. Most of the waste will be contaminated soil, but debris and CERCLA investigation-derived waste are also included in the waste inventory.

Radionuclides are contained in these CERCLA wastes destined to the ICDF. Activities associated with the handling of these wastes are anticipated to release low amounts of radionuclides into the ambient air. Airborne emissions of radionuclides are regulated by the State of Idaho (IDAPA 58.01.01.591) and EPA (40 CFR 61). The State refers to EPA's emission standard for determining compliance. 40 CFR 61, Subpart H sets a limit on "radionuclide emissions that shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose of 10 mrem/yr." Compliance with the standard is conducted on a Site-wide basis and presented to the Agencies in an Annual National Emission Standards for Hazardous Air Pollutants (NESHAP) Report.

The purpose of this document is to identify potential radionuclide emission sources from the ICDF Complex and remediation sites and define methods for estimating emissions. At the end of each calendar year, the radionuclide releases will be used as input for the CAP-88 computer code to calculate the potential dose for the maximally exposed individual (MEI). Since the ICDF is a new source of radionuclide emissions, the Annual NESHAP Report must reflect the impact from this additional source.

This document follows two reports by Steven Zohner (Zohner 2002; EDF-ER-290) that demonstrate the ICDF Complex remediation activities will be compliant with the NESHAP rules. These reports provide a foundation for the information presented in this document since much of what is presented here has been reiterated from Steven Zohner's work. However, this document updates this earlier work by providing the latest information in regards to the ICDF Complex design and knowledge of operation as well as providing details for making release estimates to support the Annual NESHAP Report.

2. BACKGROUND

In 1991, the DOE informally requested estimates of diffuse emissions from the INEEL. In response to this request, diffuse emissions sources were identified and methods for estimating diffuse emissions from suspended soil were developed. Undisturbed soil presented the greatest number of diffuse sources. However, other types of diffuse emission sources have been identified and appropriate methods were developed for estimating releases from these sources. Included in this list of sources were releases from disturbed soil and liquids (i.e., evaporation pond), which are principal sources of radionuclide emissions expected from the ICDF and remediation activities associated with the ICDF Complex.

3. EMISSION SOURCES

An evaluation of the ICDF was performed to identify all actions having the potential of releasing radionuclides into the ambient air. Since soil comprises about 70% of the waste to be sent to the ICDF and the handling of this waste is anticipated to release emissions, operations associated with the handling of the contaminated soil are expected to contribute the majority of radionuclide emissions. Other quantifiable emissions will be associated with the handling of CERCLA-generated aqueous waste that will be sent to the evaporation pond. The rate each radionuclide contaminant is released will partly depend on the volatility of the radionuclide. Volatile radionuclides will be released at a much higher rate since they are assumed to be in the gas phase. Nonvolatile radionuclide contaminants will be released in proportion to the amount of fugitive dust released or at a rate of 1 curie per 1,000 curies for the contaminants in the aqueous wastes sent to the evaporation pond.

Potential emission sources identified for the ICDF are listed below:

- Digging contaminated soil
- Loading contaminated soil
- Unloading contaminated soil
- Vehicle traffic on paved and unpaved roads
- Landfill operations
- Evaporation pond
- Waste treatment.

Most of these potential sources are anticipated to release radionuclide emissions. In some cases, no releases are anticipated. The following sections describe these sources. For those sources anticipated to release radionuclides, the emission estimating method and key assumptions are provided. For those sources not anticipated to release radionuclides, a justification is presented to explain why emissions are not anticipated.

Emissions of nonvolatile radionuclides contained in soil will be based on the amount of fugitive dust released as a result of handling the contaminated soil. Published emission factors readily available in AP-42, "Compilation of Air Emission Factors," (EPA 1995) provide a means for estimating fugitive dust released for specific operations. After the fugitive dust emissions are estimated, the radionuclide emissions can be estimated utilizing the concentration of the radionuclide in the waste.

^{14}C, ^{3}H, ^{129}I, and ^{85}Kr are volatile radionuclides. The total inventory of these radionuclides sent to the evaporation pond and landfill (^{129}I is an exception) and treated at the SSSTF will be assumed to be released into the atmosphere. ^{129}I is bound to organics in the soil and will not volatilize. However, ^{129}I may dissolve in landfill leachate. ^{129}I contained in leachate or any aqueous waste sent to the evaporation pond will be subject to solar radiation which may cause ^{129}I to volatilize. Therefore, the total inventory of ^{129}I will be assumed to be released at the evaporation pond. This method of estimating releases of volatile radionuclides is consistent with methodology presented in 40 CFR 61, Appendix D.

Care must be exercised to prevent double-counting emissions. Since waste will progress from one potential emission source to another, a portion of the radionuclide inventory may be released at each

emission source, but the aggregate released will be less than or equal to the total inventory in the waste. For example, certain contaminated soil will be stabilized in the SSSTF prior to being disposed in the landfill. If the soil contains the volatile radionuclide ^{3}H, a portion may be released in the SSSTF and a portion in the landfill, or the entire inventory may be released in the SSSTF; therefore, in the latter case, no emissions would occur at the landfill. In no case can the total releases exceed the inventory of the contaminant. To prevent overestimation of emissions, emission estimates must be coordinated with the waste generators to prevent double-counting.

A computer-based program is under development to aid in emission calculations. The program will provide year-to-date emission estimates from all the ICDF emission sources. Additionally, the program will provide a radionuclide inventory accounting that will aid in preventing overestimation of emissions.

3.1 Excavation of Contaminated Soil

The action of digging contaminated soil is anticipated to release radionuclide emissions. Within the ICDF, CERCLA wastes may be staged in storage piles. Eventually, the waste will be dug up and loaded into transport containers to be taken to the treatment facility or landfill. The activity of digging the soil may result in fugitive dust and, consequently, radionuclide emissions. The amount of radionuclide emissions will be proportional to the amount of dust released. EPA's AP-42 does not specifically provide an emission factor for this activity or make a reference to one. Therefore, fugitive dust emissions associated with excavation of contaminated soil will be estimated using the same emission factor and assumptions used for loading contaminated soil as discussed below.

3.2 Loading Contaminated Soil

Loading contaminated soil is anticipated to release fugitive dust and radionuclides into the ambient air. As the soil is disturbed during dumping into a container or transport vehicle, fugitive dust and, consequently, radionuclides, will be released. Contaminated soil may be loaded within the ICDF. The amount of fugitive dust released may be estimated utilizing the following AP-42 emission factor for batch drop operations (EPA 1995, Section 13.2.4, Aggregate Handling and Storage Piles):

$$E = k(0.0032)\frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \text{ (lb TSP/ton)}$$

where

E = emission factor, lb total suspended particulate (TSP)/ton of waste.

k = particle size multiplier (dimensionless). For aerodynamic particle size < 30 um, k = 0.74.

U = mean wind speed, miles per hour (mph). Mean wind speed for the Site is 9.6 mph (IDEQ 2001).

M = material moisture content (%), moisture content is estimated at 11.7% (EDF-ER-274, Table C-1, difference between total porosity of 26.6% and air porosity of 14.9%).

Substituting these values into the equation yields the factor for uncontrolled emissions.

$$E = k(0.0032)\frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} = 0.74(0.0032)\frac{\left(\frac{9.6}{5}\right)^{1.3}}{\left(\frac{11.7}{2}\right)^{1.4}} = 0.000466 \text{ lb TSP / ton waste}.$$

Water will be used to control fugitive dust emissions. A control efficiency of 50% can be applied for wet suppression (EPA 1992).

Accounting for the 50% control efficiency and converting the units to (lb TSP)/(lb waste soil) yields

$$E = k(0.0032)\frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}(1-0.5) = 0.74(0.0032)\frac{\left(\frac{9.6}{5}\right)^{1.3}}{\left(\frac{11.7}{2}\right)^{1.4}}(1-0.5)\left(\frac{1 \text{ ton}}{2000 \text{ lb}}\right) = \frac{1.166E-7 \text{ lb TSP}}{\text{lb waste soil}}.$$

Radionuclide emissions are estimated by first multiplying this emission factor by the amount of soil from each waste site loaded during the calendar year. This results in pounds of fugitive dust (TSP) released. Since the radionuclides are contained in the dust, the amount of each radionuclide released is then determined by multiplying the radionuclide concentration by the fugitive dust released. Radionuclide concentrations vary among waste sites, so separate emission estimates must be made for each waste site.

As an example, assuming 1,000,000 lb of waste soil from Sites CPP-01, -04, -05 were loaded during a calendar year, the amount of fugitive dust released is

$$E = (1{,}000{,}000 \text{ lb waste soil})\left(\frac{1.66E\text{-}7 \text{lb TSP}}{\text{lb waste soil}}\right) = 0.1166 \text{ lb TSP}.$$

Radionuclide emissions are estimated by multiplying the fugitive dust emissions by the concentration of each radionuclide contained in the waste. For example, if the waste contained ^{137}Cs at a concentration of 2.1E+4 pCi/g, the amount of ^{137}Cs released is

$$E = 0.1166 \text{ lb TSP}\left(\frac{2.1E+4 \text{ pCi}}{\text{g}}\right)\left(\frac{454 \text{ g}}{\text{lb}}\right)\left(\frac{\text{Ci}}{1(10)^{12} \text{ pCi}}\right) = 1.11E-6 \text{ curies } ^{137}\text{Cs}.$$

3.3 Unloading Contaminated Soil

Contaminated soil will be unloaded in various locations within the ICDF. Fugitive emissions are anticipated for unloading contaminated soil. The contaminated soil will be packaged in bags within boxes and bags within roll-on/roll-off containers. These bags are expected to maintain their integrity when unloaded; only minor ruptures may occur. These minor ruptures have the potential of allowing a small amount of dust to be generated. Measures will be taken to control dust emissions; specifically, charged water lines will be available to wet exposed material and the drop height from the back of the transport vehicles will be kept to a minimum.

Emissions from unloading contaminated soil will be estimated using the first equation from Section 3.2 with an adjustment for the added control of fugitive dust afforded by the use of the containment bags. The combined control efficiency for wet suppression and containment bags is 90%[a]. This combined control efficiency was determined by engineering judgement, assuming 80% control for containment bags and 50% control for wet suppression. Accounting for the additional fugitive dust control, the emission factor becomes

$$E = 0.74(0.0032)\frac{\left(\frac{9.6}{5}\right)^{1.3}}{\left(\frac{11.7}{2}\right)^{1.4}}(1-0.9)\left(\frac{1\,\text{ton}}{2000\,\text{lb}}\right) = \frac{2.33E-8\,\text{lb TSP}}{\text{lb waste soil}}.$$

Waste that is not bagged will only receive a 50% control efficiency. The emission factor must be modified by replacing the quantity (1 - 0.9) with (1 - 0.5).

This emission factor is applied in the same way the emission factor is applied in Section 3.2. Radionuclide emissions are estimated by first multiplying this emission factor by the total amount of soil from each remediation site unloaded during the calendar year. This results in the pounds of fugitive dust (TSP) released. Since the radionuclides are contained in the dust, the amount of each radionuclide released is then determined by multiplying the radionuclide concentration for each waste by the fugitive dust released.

Due to the subsequent handling of the bags once disposed of in the landfill, the bags will be compromised, exposing the contents and making contaminated soil more susceptible to release as fugitive dust. Section 3.5 discusses estimating radionuclide releases from landfill operations.

3.4 Vehicle Traffic on Paved and Unpaved Roads

Radionuclides will not be released from vehicle traffic on unpaved and paved roads. Vehicle movement will be controlled to keep vehicles away from contaminated areas. Further, prior to any vehicles leaving the dig sites, the SSSTF, and the landfill, they will be inspected to verify they are free of any loose contamination. Through these controls, contamination will not be spread onto the roadways where it would be susceptible to release.

3.5 Landfill Operations

Landfill operations are anticipated to release radionuclide emissions. Emissions will be in the gaseous and particulate forms. ^{14}C, ^{3}H, and ^{85}Kr are considered volatile radionuclides and will be released as gaseous emissions. (^{129}I is assumed to be volatile when in an aqueous waste.) All other radionuclides will be tied to fugitive dust emissions. The operations that will generate emissions are pushing waste material with a dozer, compacting waste material with a dozer, placing landfill cover materials with a dozer, and windblown dust. Emission factors are available that estimate fugitive dust emissions for bulldozing and windblown dust. These emissions factors will be used to estimate the nonvolatile emissions. Emissions of volatile radionuclides will be conservatively estimated by assuming the entire inventory is released in the landfill.

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a. If a bag contains 100 lb soil and the containment bag is estimated to provide 80% control, then 20 lb would potentially be exposed. If water is used to control emissions from the exposed soil and 50% control efficiency is applied, then 10 lb would be used to base an emission estimate. The overall control efficiency becomes: (100 lb –10 lb)/100 lb = 0.9.

3.5.1 Volatile Radionuclide Emissions

The volatile radionuclides, ^{14}C, ^{3}H, and ^{85}Kr, are contaminants found in many types of solid waste that will be disposed of in the landfill. Only untreated soils disposed of in the landfill are considered in this section. Sections 3.6 and 3.7 address emissions from the evaporation pond and treatment facility. Emissions will be estimated through a very conservative approach, which assumes the entire inventory of the radionuclides placed in the landfill are released. The Integrated Waste Tracking System (IWTS) can be queried for the amount of each radionuclide disposed of in the landfill. The amount assumed to be released will equal the amount placed in the landfill. Care must be taken to prevent double-counting emissions. Radionuclides released from a prior handling activity must be subtracted from the inventory going to the landfill.

3.5.2 Emissions from Bulldozing

Emissions from bulldozing will be estimated by first determining the fugitive dust emissions, which is then multiplied by the concentration of each radionuclide from each waste stream placed in the landfill. Section 11.9 of AP-42 contains an emission factor for specifically for bulldozing (EPA 1995). The factor was derived from bulldozing overburden at western coal mines. Even though the factor was derived under a different setting, the conditions between the two settings are considered to be similar, so the emission factor should produce reasonable estimates. The quantity of uncontrolled fugitive dust generated per hour of dozer activity can be estimated using the following emission factor:

$$E = \frac{5.7(s)^{1.2}}{(M)^{1.3}} \text{ lb TSP / hour}$$

where

s = material silt content (%). For soils to be disposed of at the ICDF, the material silt content is assumed to be 7%.

M = material moisture content (%). Moisture content is assumed to be the same as used in Section 3.2.

Substituting these values into the equation yields the following factor that provides total uncontrolled fugitive dust released per hour of bulldozing:

$$E = \frac{5.7(s)^{1.2}}{(M)^{1.3}} = \frac{5.7(7)^{1.2}}{(11.7)^{1.3}} = \frac{2.4 \text{ lb TSP}}{\text{hr}} \quad .$$

While the contaminated soil will be unloaded in bags, the dozer will damage the bags, rendering them useless for controlling dust. Emissions will be controlled by use of wet suppression. The control efficiency for wet suppression is 50% (EPA 1992). Accounting for the control efficiency, the emission factor becomes:

$$E = \frac{5.7(s)^{1.2}}{(M)^{1.3}} = \frac{5.7(7)^{1.2}}{(11.7)^{1.3}}(1 - 0.5) = \frac{1.2 \text{ lb TSP}}{\text{hr}} \quad .$$

Radionuclide emissions are estimated by first multiplying this emission factor by the hours of dozer operation during the calendar year. This results in pounds of fugitive dust (TSP) released.

Radionuclide emissions will be proportional to the concentration of the radionuclides contained in the dust. To determine the concentration of each radionuclide in the dust, the IWTS can be queried for the total pounds of soil and total of each radionuclide (in curies) placed into the landfill from each waste stream during the calendar year. Dividing the total curies (Ci) by the total weight of soil (pounds) will result in the radionuclide concentration.

As an example, assuming the dozer operates 10 hours per day, 4 days per week, for 39 weeks a year, and querying IWTS for the total amount of soil and curies of ^{137}Cs placed in the landfill produces 400,000,000 lb and 1,000 curies. The emissions of ^{137}Cs would be estimated as follows:

$$E = \frac{1.2 \text{ lb TSP}}{\text{hr}}\left(\frac{10 \text{ hr}}{\text{day}}\right)\left(\frac{4 \text{ days}}{\text{week}}\right)\left(\frac{39 \text{ weeks}}{\text{year}}\right)\left(\frac{1{,}000 \text{ Ci } ^{137}\text{Cs}}{400{,}000{,}000 \text{ lb soil}}\right) = 4.68\text{E}-3 \text{ Ci } ^{137}\text{Cs}.$$

3.5.3 Windblown Dust

Section 11.9 of AP-42 also contains an emission factor specifically for windblown dust (EPA 1995). Likewise, this factor was derived at western coal mines:

$$E = 0.38\frac{\text{ton TSP}}{(\text{acre})(\text{yr})}.$$

The units of the emission factor can be converted to pounds TSP per square foot – day to make it more user-friendly:

$$E = 0.38\frac{\text{ton TSP}}{(\text{acre})(\text{yr})}\left(\frac{2000 \text{ lb}}{\text{ton}}\right)\left(\frac{1 \text{ acre}}{43560 \text{ ft}^2}\right)\left(\frac{1 \text{ yr}}{365 \text{ days}}\right) = 4.78\text{E}-5\frac{\text{lb TSP}}{\text{ft}^2 \text{ day}}.$$

This emission factor may be used to estimate radionuclide emissions due to windblown dust from specific inactive areas of the landfill. The inactive areas of the landfill with the potential of releasing radionuclide emissions are the areas occupied by contaminated soil that have not been covered with clean soil and that have been and treated with a chemical suppressant. The chemical suppressant will control emissions by approximately 90% (EPA 1995, Section 13.2.4). The portion of the landfill covered with clean soil will not contribute to emissions since the soil will cover over the contaminated waste. The amount of the landfill area covered with clean cover will be excluded from the emission estimate.

Determining the actual treated area for each day of landfill operation will be difficult. For simplification, the landfill area (in ft^2) occupied by the waste received during the calendar year can be determined from the landfill geographical information system (GIS) mapping. This area can be divided with 50% assumed to be covered with clean soil and 50% treated with the chemical suppressant. To estimate emissions, multiply the emission factor by the total days of landfill operation for the calendar year and by the area treated with suppressant. For example, if the landfill operated for 4 days per week for 39 weeks and the landfill area occupied by waste increased by 150,000 ft^2 during the year, the uncontrolled fugitive dust emissions would be calculated as follows:

$$E = 4.78\text{E}-5\frac{\text{lb TSP}}{\text{ft}^2 \text{ day}}\left(\frac{4 \text{ day}}{\text{week}}\right)\left(\frac{39 \text{ weeks}}{\text{yr}}\right)\left(150{,}000 \text{ ft}^2\right) = 1{,}118 \text{ lb TSP}.$$

Radionuclide emissions will be estimated by multiplying the amount of fugitive dust released by the concentration of each radionuclide placed in the landfill. To determine the concentration of each

radionuclide, the IWTS can be queried for the total pounds of soil and total of each radionuclide (in curies) placed into the landfill during the calendar year. Dividing the total curies (Ci) by the total weight of soil (pounds) will result in the radionuclide concentrations. For example, querying IWTS for the total amount of soil and curies of ^{137}Cs placed in the landfill produces 400,000,000 lb and 1,000 curies. According to AP-42, Section 13.2.4, using chemical suppressants can reduce total particulate emissions by 90% (EPA 1995). Accounting for the control efficiency (90%), emissions of ^{137}Cs can be estimated as follows:

$$E = 1{,}118 \text{ lb TSP}\left(\frac{1{,}000 \text{ Ci } ^{137}\text{Cs}}{400{,}000{,}000 \text{ lb soil}}\right)(1 - 0.9) = 2.8E-4 \text{ Ci } ^{137}\text{Cs}.$$

3.6 Evaporation Pond

The evaporation pond will receive CERCLA-derived aqueous wastes. These aqueous wastes will contain low concentrations of radionuclides. Emissions will be approximated using EPA methods for estimating radionuclide emissions as detailed in 40 CFR 61, Appendix D. Volatile radionuclide emissions will be released at a rate of 1 curie per curie (1 Ci/1 Ci). Nonvolatile radionuclides will be released at a rate of 1 curie per 1,000 curies (1 Ci/1,000 Ci). ^{14}C, ^{3}H, ^{85}Kr, and ^{129}I are considered volatile radionuclides at the evaporation pond. The remaining radionuclides are assumed to be solids. Total curies of volatile and nonvolatile radionuclides can be queried from IWTS.

For example, if a query of IWTS produces 0.02 curies of ^{129}I and 5 curies of ^{137}Cs were sent to the pond during a calendar year, emissions will be calculated as follows:

$$E_{I-129} = 0.02 \text{ Ci}\left(\frac{1 \text{ Ci released}}{1 \text{ Ci sent to ponds}}\right) = 0.02 \text{ curies } ^{129}\text{I released}$$

$$E_{Cs-137} = 5 \text{ Ci}\left(\frac{1 \text{ Ci released}}{1{,}000 \text{ Ci sent to ponds}}\right) = 0.005 \text{ curies } ^{137}\text{Cs released}.$$

3.7 Decon Building Operations

This section addresses emissions from the decon building. The main operations to be conducted within the building are soil stabilization, debris treatment, and waste repackaging. Debris treated in containers will be assumed to not release emissions since the debris will be encapsulated within the containers.

All handling of waste conducted within the decon building will be in a very controlled setting. The only pathways for emissions to leave the building are through doorways and high-efficiency particulate air (HEPA) filtration vents. When waste is processed, the building doors will be closed. The waste processing equipment will use a dedicated dust control device and water to control dust. Any dust not removed by this control device will be ventilated through the decon building HEPA filtration systems. These HEPA filtration systems are 99.97% effective at dust removal. However, certain operations may not benefit from the dedicated control device, so, as a conservative approach, the use of water and the HEPA filtration systems will be assumed to be the only effective emission control.

The decon building emission controls will reduce nonvolatile radionuclides but it will not be effective at controlling volatile radionuclides. Nonvolatile radionuclide emissions will be calculated using

the emission factor presented in Sections 3.1, 3.2, and 3.3 with a modification for the combined control efficiency provided by the water (50% control) and the HEPA filtration systems (each HEPA filtration system has two 99.97% efficient filters in series). Emissions of volatile radionuclides, ^{14}C, ^{3}H, ^{85}Kr, and ^{129}I, will be calculated following the method presented in Section 3.6. ^{129}I is conservatively assumed to be volatile in the SSSTF building since the waste processing operations could produce conditions favorable for volatilization.

The modified emission factor for digging, loading, and unloading contaminated soil within the decon building is as follows:

$$E = 0.74(0.0032)\frac{\left(\frac{9.6}{5}\right)^{1.3}}{\left(\frac{11.7}{2}\right)^{1.4}}(1-0.5)(1-0.9997)^{2}\left(\frac{1\text{ ton}}{2000\text{ lb}}\right) = \frac{1.05E-14\text{ lb TSP}}{\text{lb waste soil}}.$$

Emissions calculated using this factor are carried out in the same way as emissions are calculated in Section 3.2.

Areas outside the decon building may be used to stage contaminated soil. The soil may be staged in piles. Radionuclide emissions should be estimated for unloading, digging, and loading the soil. Emissions can be estimated by following the methods presented in Sections 3.1, 3.2, and 3.3.

4. COMPLIANCE DETERMINATION

Compliance with the NESHAP standard is demonstrated annually on a Site-wide basis. Radionuclide emissions from all the ICDF sources must be calculated to units of curies/yr and turned into the INEEL NESHAP coordinator before March 28 of the following year. The emission estimates will be used as input to the CAP-88 computer code. CAP-88 will model the emissions to determine the effective dose to the MEI. Compliance will be demonstrated if the Site-wide dose is less than 10 mrem/yr (40 CFR 61) and the dose from the ICDF is less 1 mrem/yr (DOE-ID 2002a). Should emissions from the ICDF exceed 1 mrem/yr, the Agencies will be notified.

5. SUMMARY

The OU 3-13 ROD requires the on-Site disposal of CERCLA-derived wastes. The ICDF was constructed to accommodate the requirements of the ROD. The ICDF Complex comprises three main components: (1) landfill, (2) evaporation pond, and (3) SSSTF, which includes the decon building. Waste handling within the ICDF is anticipated to contribute to the Site-wide inventory of NESHAP emissions. The purpose of this document is to identify the ICDF emission sources as identified in Section 3 and present methods for estimating the emissions as found in Sections 3.1 through 3.7.

NESHAP emission sources within the ICDF are digging contaminated soil, loading contaminated soil, landfill operations, evaporation pond, and waste treatment in the decon building. Radionuclide emissions from these sources can be estimated by using fugitive dust emission factors from AP-42 (EPA 1995) and resuspension factors from 40 CFR 61, Appendix D. Emissions calculated by these means will be used as input to the CAP-88 computer code to determine the annual dose to the MEI on a Site-wide basis. Compliance is demonstrated if the effective dose on a Site-wide basis is less than 10 mrem/yr and the effective dose from the ICDF is less than 1 mrem/yr.

6. REFERENCES

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